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General Mills, Inc.
Mechanical Division

**ENGINEERING RESEARCH & DEVELOPMENT
DEPARTMENT**

**2003 EAST HENNEPIN AVENUE
MINNEAPOLIS 13, MINN.**

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FINAL REPORT

CONTRACT NO. Nonr 875(00)

Annex IX

4 April 1954

Prepared for

The Office of Naval Research
Washington, D. C.

Report No. 1303

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Approved by:

C. Brunetti
Cledo Brunetti, Director *280*

GENERAL MILLS, INC.
Mechanical Division
ENGINEERING RESEARCH AND DEVELOPMENT
2003 E. Hennepin
Minneapolis 13, Minn.

I. AIMS

On 1 April 1953, Contract Nonr 875(00) between General Mills, Inc. and the Office of Naval Research was amended to provide for the execution of shipboard balloon flights during the summer of 1953 at northerly latitudes. Plastic balloons were used to hoist Deacon rockets with scientific equipment housed in the warhead. The scientific payloads were supplied by the Naval Research Laboratory and Iowa State University. General Mills, Inc. supplied "Skyhook" balloons, balloon controls and safety equipment. Engineering services for launching and telemetering altitude information were also supplied by General Mills technical personnel.

II. WORK ACCOMPLISHED

The project consisted of two series of launchings from ice-breakers, one series from the U.S.S. Staten Island and the other from the U.S.C.G.C. Eastwind. In general, the series of launchings from the U.S.S. Staten Island were made between Boston, Mass. and Thule, Greenland, from the middle of July to the middle of August, 1953. The series of launchings from the U.S.C.G.C. Eastwind were made the last of August and the first of September between the Straits of Belle Isle and Boston. Specific launch positions are tabulated in the next section.

General Mills balloons were used as vehicles to carry rockets to high altitudes before being fired.

Two types of balloons were used, a 55 foot balloon for all the Iowa State University flights and a 68 foot balloon for the Naval Research Laboratory flights. All flights carried the following equipment:

1. Balloon control instruments, including safety timers and descent switches.
2. Radiosonde, AN/AMT-7A, for telemetering altitude.
3. Deacon rocket.
4. Firing unit for rocket.
5. Scientific payload in warhead of rocket.

The Iowa State University flights carried cosmic ray equipment in the rocket warhead and the Naval Research Laboratory flights were instrumented to measure physical properties of the upper atmosphere.

In the first series, 10 flights were made for Iowa State University, and 4 flights for the Naval Research Laboratory. In the second series, 6 flights were made for Iowa State University and 2 for the Naval Research Laboratory. Of this total of 22 flights, 5 were not successful as a result of failures of the rockets to ignite. One balloon failed prematurely, and on 2 flights the rockets failed to fire but the cause of failure was unknown, and may have included faulty timers.

Except for the Iowa State University flights on the U.S.S. Staten Island series, for which no altitude data are available, the flight data are presented in the next section.

It is hoped that the scientific payload performed satisfactorily and that the entire operation met with success. General Mills, Inc. is happy to have had the opportunity of working with the Office of Naval Research and Iowa State University in carrying out these experiments.

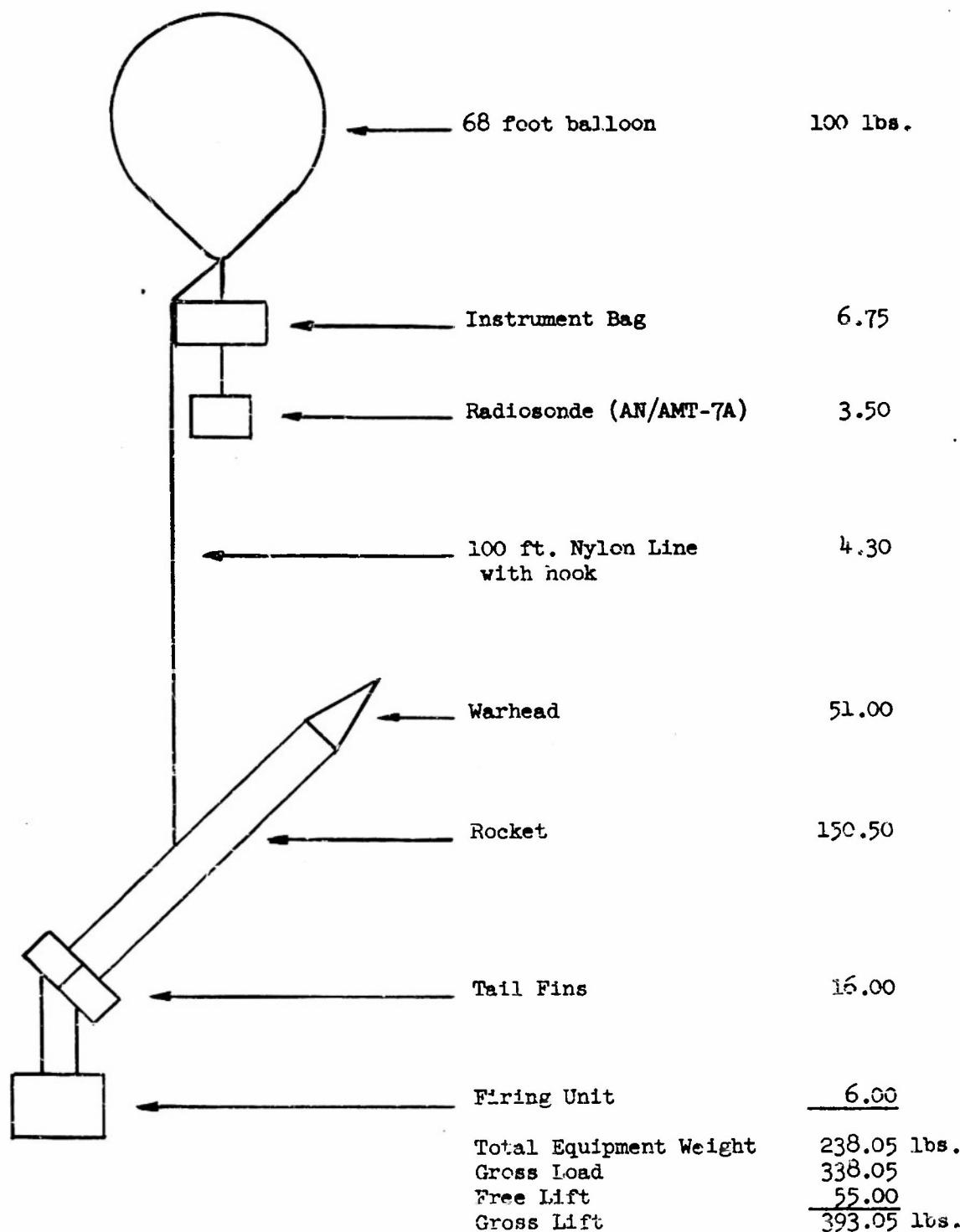
Flights from U. S. S. Staten Island

<u>Flight No.</u>	<u>Date</u>	<u>Time</u>	<u>Launch Position</u>
1011	18 July	2327Z	42-26.2 N, 70-22 W
1012	19 July	2330Z	43-04 N, 65-07 W
1013	19 July	1653Z	43-41 N, 63-28.5 W
1014	19 July	2257Z	44-16 N, 62-09.5 W
1015	24 July	1640Z	58-32.5 N, 61-55 W
1016	28 July	0941Z	62-30.5 N, 64-13.5 W
1017	3 August	1828Z	62-45 N, 66-15 W
1018	5 August	2154Z	62-04 N, 63-55 W
1019	6 August	1507Z	64-20 N, 59-06 W
1020	6 August	1840Z	65-13 N, 58-35 W
1021	8 August	1509Z	73-37 N, 61-37 W
1022	9 August	0554Z	74-23 N, 71-56 W
1023	9 August	0915Z	74-29 N, 73-31 W
1024	11 August	1709Z	74-34 N, 94-29 W

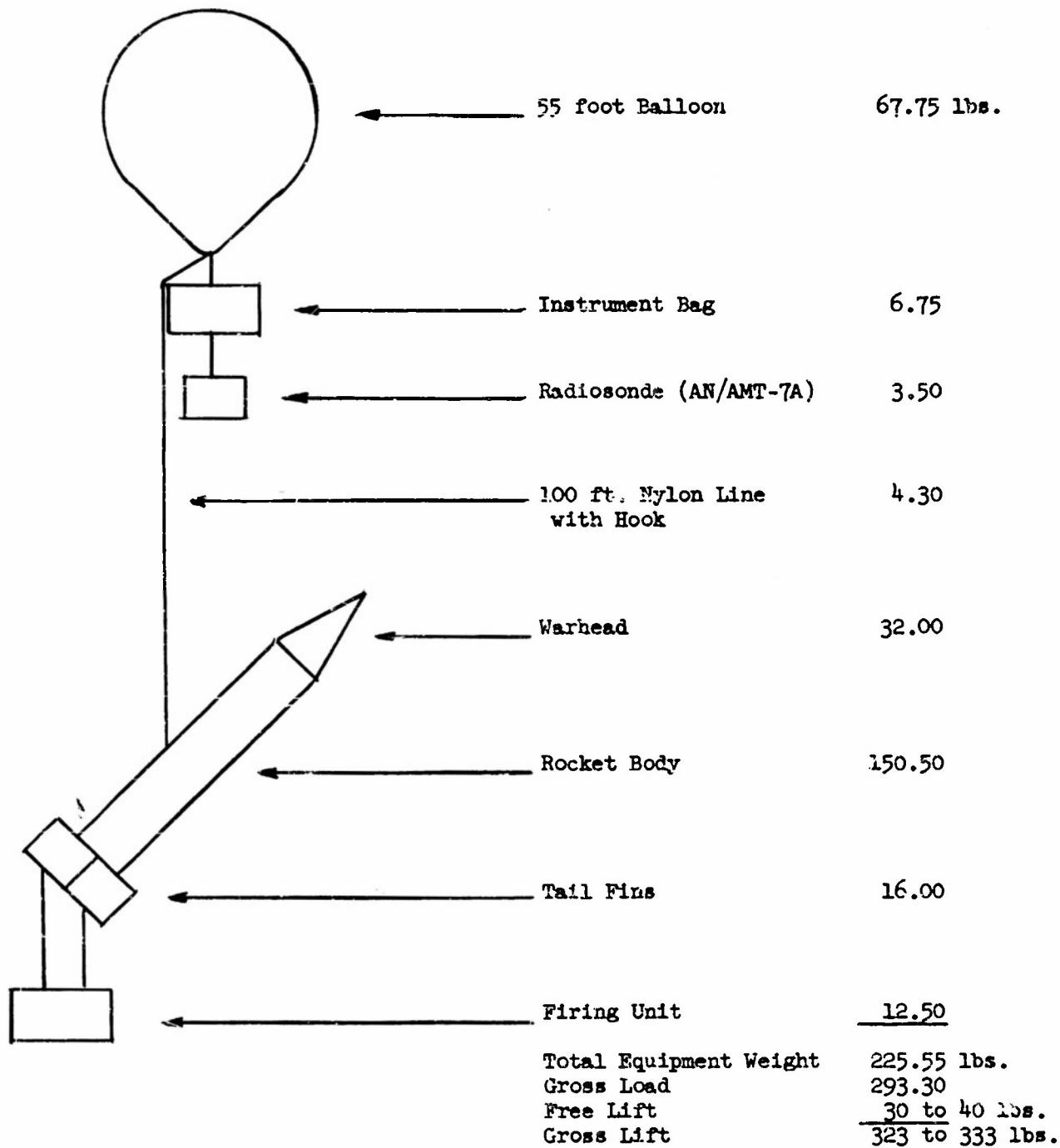
Flights from U.S.C.G.C Eastwind

1025	30 August	1400Z	53-06 N, 55-05 W
1026	30 August	1620Z	52-47 N, 55-24 W
1027	30 August	2046Z	53-08 N, 54-45 W
1028	3 September	0950Z	44-50 N, 57-13 W
1029	3 September	1151Z	44-45 N, 57-10 W
1030	3 September	1405Z	44-33 N, 57-03 W
1031	4 September	0359Z	43-30 N, 59-20 W
1032	4 September	1551Z	43-00 N, 62-30 W

TYPICAL NAVAL RESEARCH LABORATORY TYPE FLIGHT



TYPICAL IOWA STATE UNIVERSITY TYPE FLIGHT



47° 25' 10" TO 47° 25' 11" 359.11

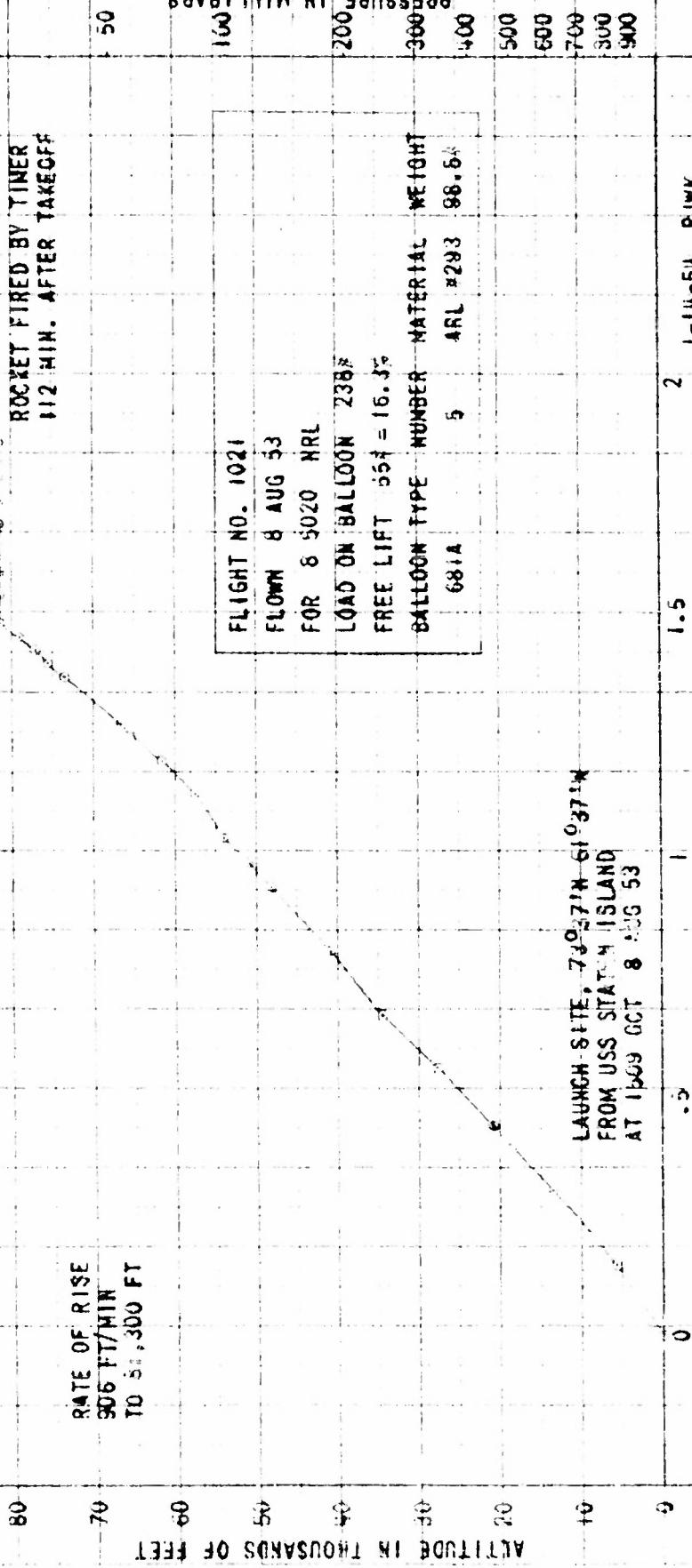
AN/AHT-7A #8448

THEORETICAL CEILING

25

ROCKET FIRED BY TINER
112 MIN. AFTER TAKEOFF

RATE OF RISE
306 FT/MIN
TO 51,300 FT



100
200
300
PRESSURE IN MILLIBARS

FLIGHT NO. 1021

FLOWN 8 AUG 53
FOR 8 3020 NRL

LOAD ON BALLOON 2367

FREE LIFT 554 = 16.3%

BALLOON TYPE NUMBER MATERIAL WEIGHT
681A 5 ARL #293 98.64
400

500

600

700

800

900

1.5

ELAPSED TIME IN HOURS

1700

1630

1530

1500

2 1-14-54 RUMK
APPROVED

GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINN.
GREENWICH CIVIL TIME

10 X 10 TO THE 2 INCH
MATERIALS
359.11

AN/AVT-7A #84467

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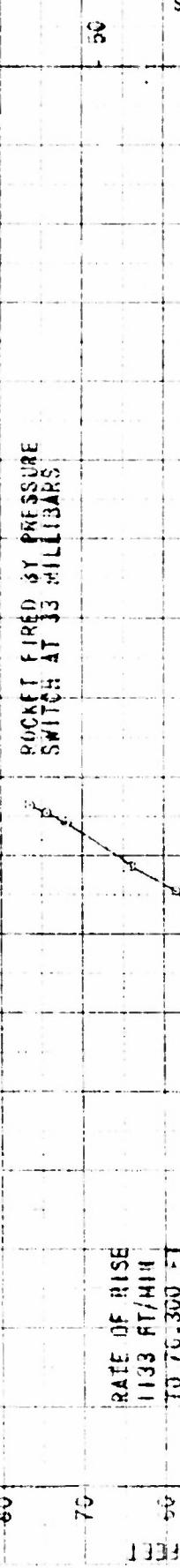
60

GENERAL MILLS, INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINN.

359.11

9 AN/ASNT-7A 48465

THEORETICAL CEILING



FLIGHT NO. 1024

FLown 11 AUG 53
For 5020 NRL
Load on balloon 233
Free fall 65 P-15-5
Balloon type number material weight
L61A 6 ABL 293 954
Launch site, $74^{\circ}34'N$ $94^{\circ}25'W$
From USS STATEN ISLAND
At 1205 GCT - 11 Aug 53

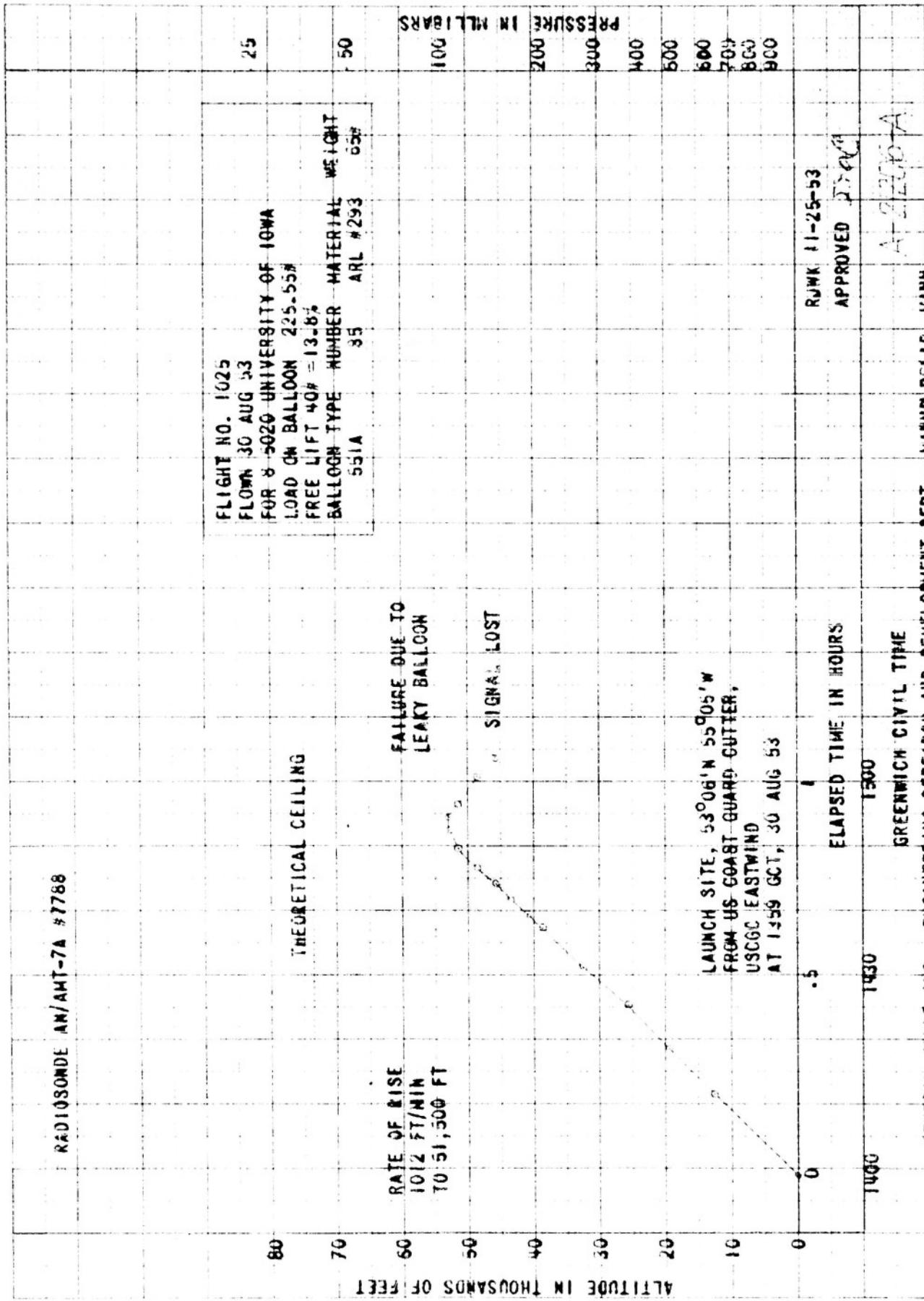
2-10-54 Project

APPROVED

1500 1600 1630
GREENWICH CIVIL TIME

GENERAL MILLS, INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINN. 1954

RADIOSONDE AN/AMT-7A #1788



10 X 10 TO THE 1/16 INCH 359.11
KODAK SAFETY FILM

RADIOSONDE AN/ANT-7A #1730

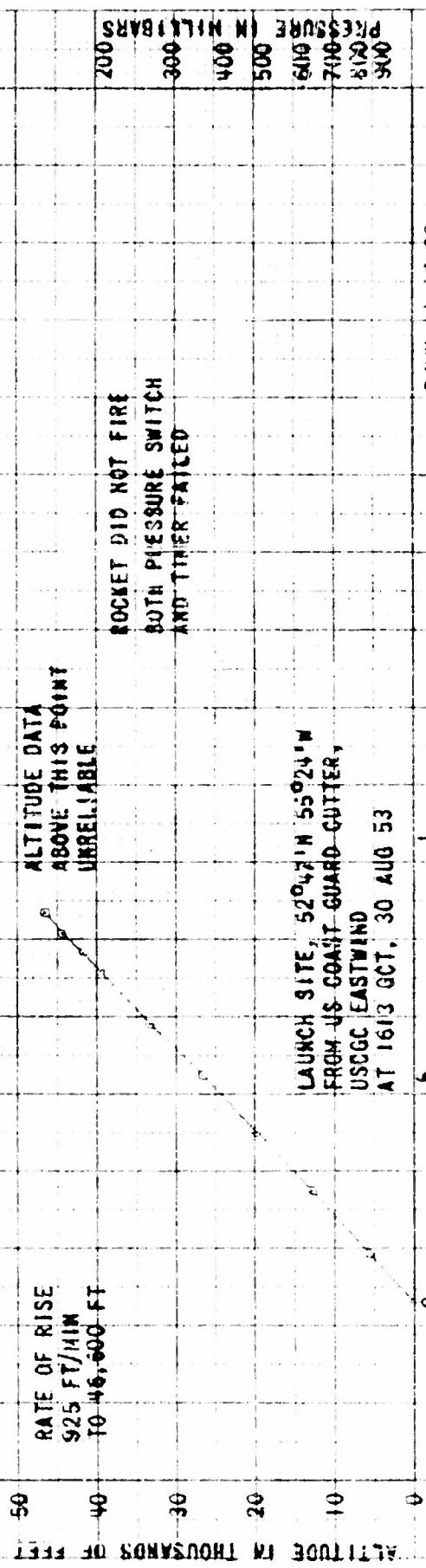
FLIGHT DURATION 3.8 HOURS

FLIGHT NO. 1026
FLYAWAY 30 AUG 53
FOR A 5020 UNIVERSITY OF IOWA
LOAD 10% BALLOON 225.55#
FREE LIFT 40# = 13.85
BALLOON TYPE NUMBER MATERIAL WEIGHT
551A 62 ARL #283 63.6#

THEORETICAL CEILING

BALLOON FLOATED WITHIN THIS RANGE

LOAD RELEASED FROM
BALLOON BY TIMER
AT 2000 GCT



RJWK 11-30-53
APPROVED D.G.R.

1700
GREENWICH CIVIL TIME

GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINN.

10 X 10 TO THE INCH 359-11

RADIOSONDE AN/AMT-7A #1792

FLIGHT NO. 1027

FLOWN 30 AUG 53

FOR 3 5020 UNIVERSITY OF IOWA

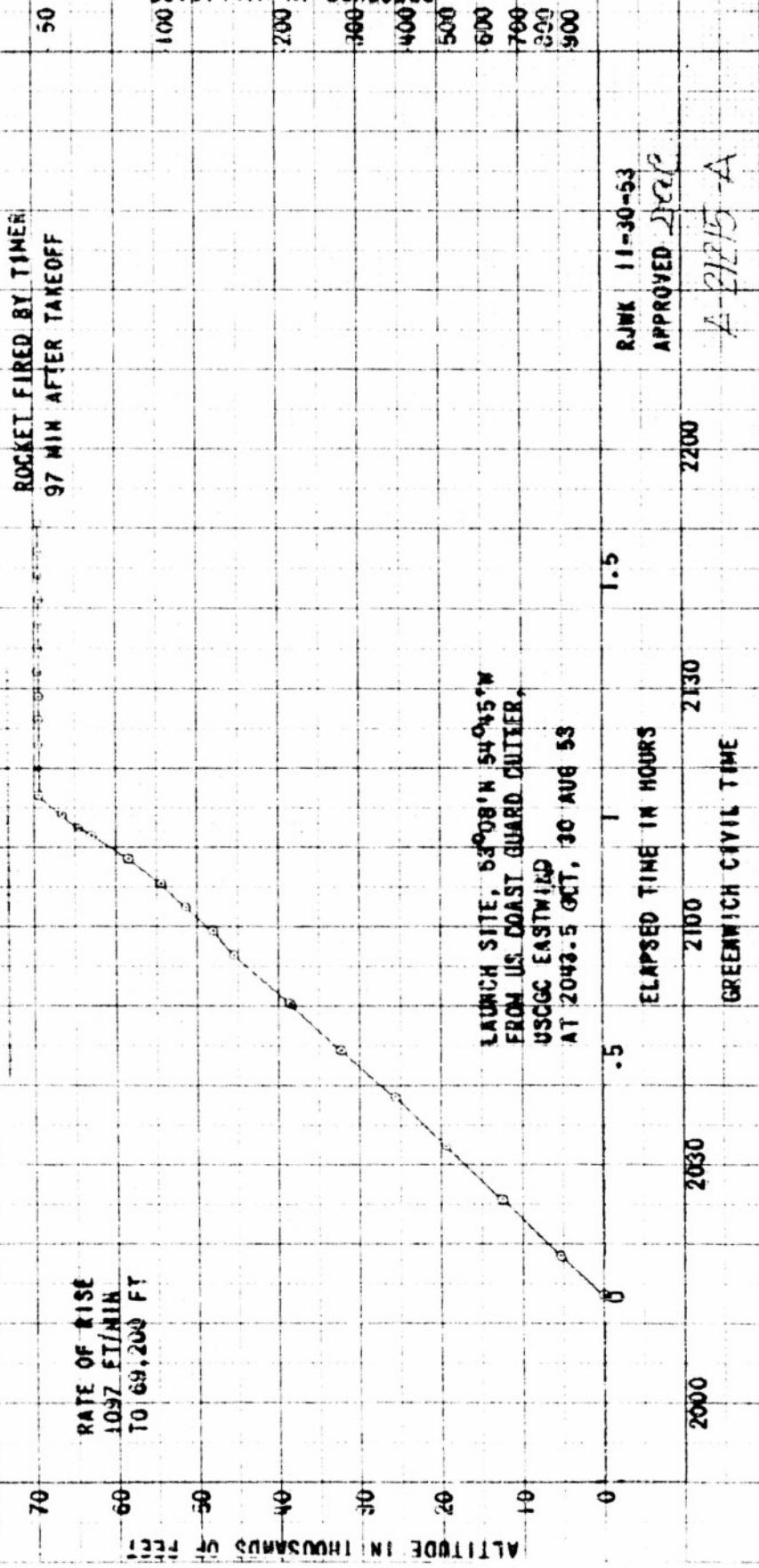
LOAD ON BALLOON 225.554

FREE LIFT 47% = 16.24

BALLOON TYPE NUMBER MATERIAL WEIGHT
661A 34 ARL #293 647

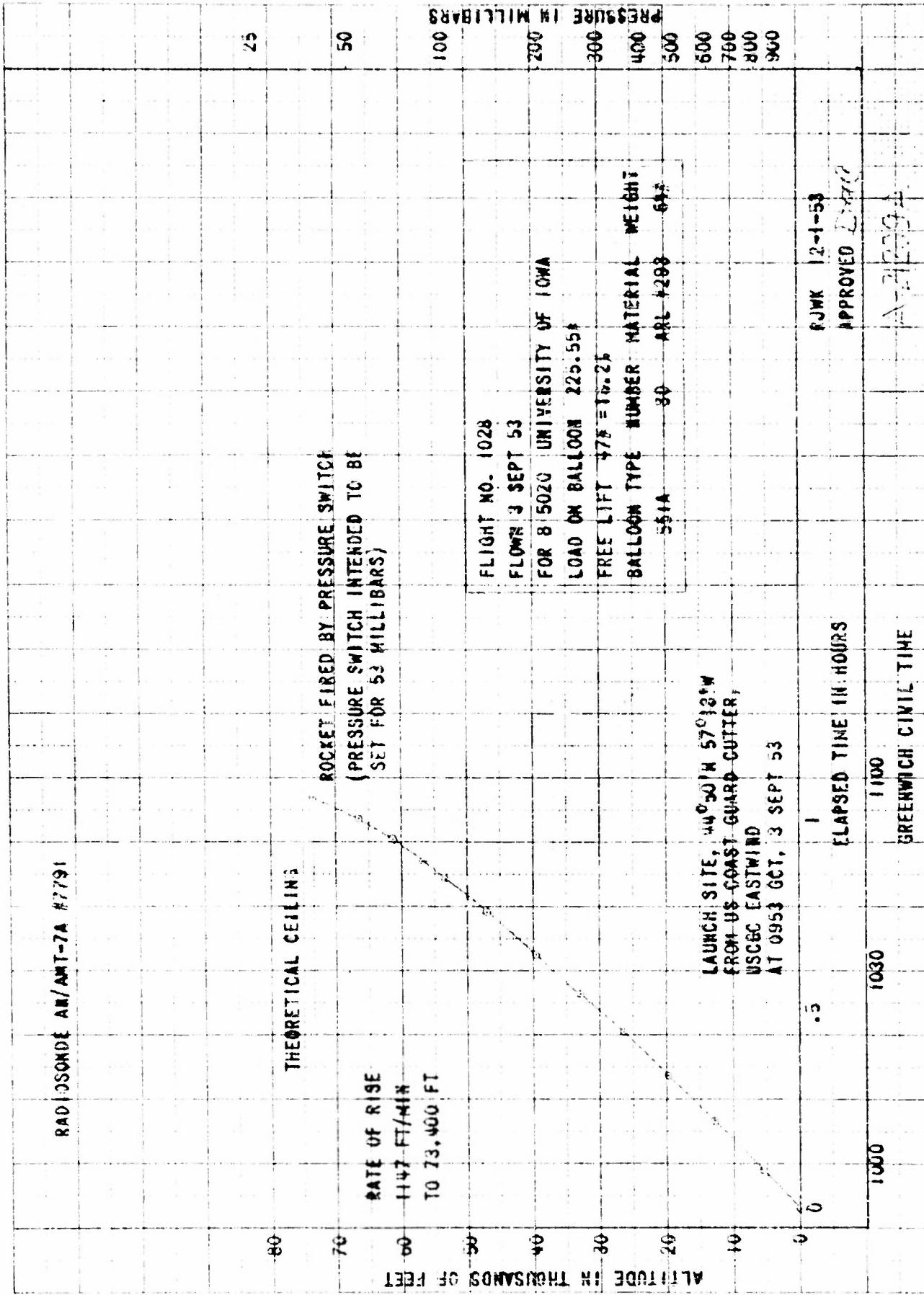
25

THEORETICAL CEILING



359 11
10 x 10 THE T. L. N. C. H. 2

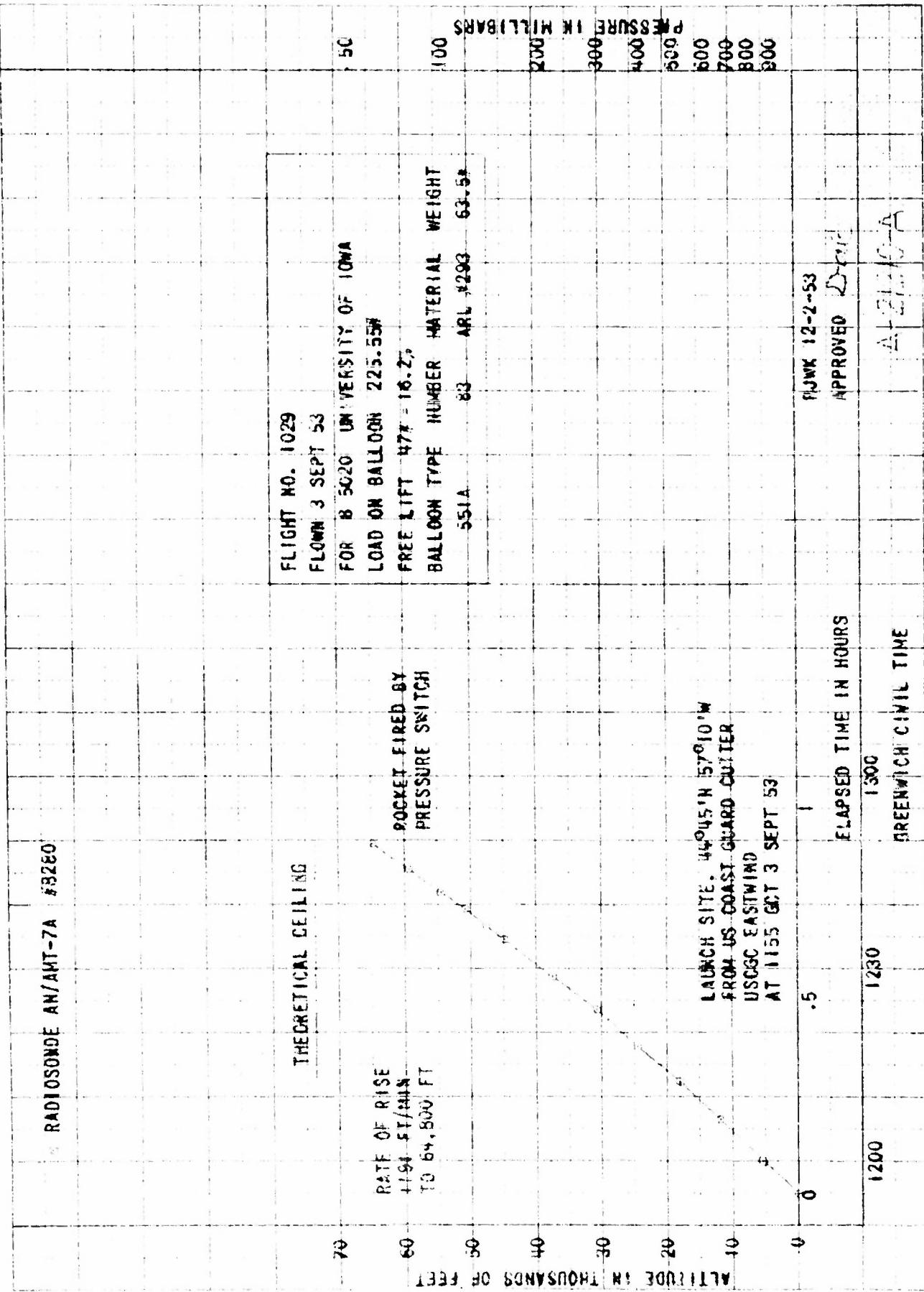
800 0380001 AN/AW T-7A 42791



GENERAL MILLS INC. ENGINEERING RESEARCH AND DEVELOPMENT DEPT. - MINNEAPOLIS

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RADIOSONDÉ AN/ANT-7A 483280



GENERAL HILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINN.

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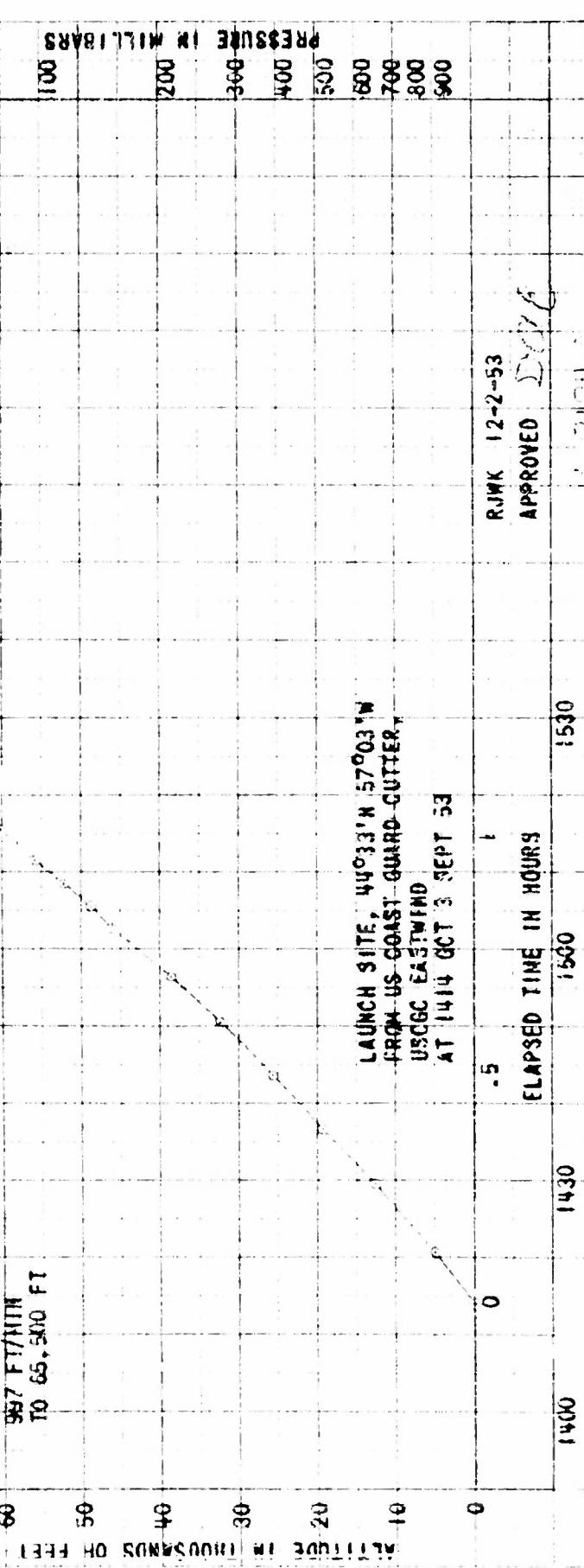
10 X 10 TO THE 1/2 INCH 359-11
GENERAL MILLS INC. APPROVED

RADIOSONDE AN/ANT-7A #8277

FLIGHT NO. 1030
FLIGHT 3 SEPT 53
FOR 8 5020 UNIVERSITY OF IOWA
LOAD ON BALLOON 225.55#
FREE LIFT 47# = 10.2%

THEORETICAL CEILING
BALLOON TYPE NUMBER MATERIAL WEIGHT
SSIA 84 ARL 1233 65#

ROCKET FIRED BY PRESSURE SWITCH



LAUNCH SITE, 44°33'N 57°03'W
FROM US COAST GUARD CUTTER
USCGC EASTWIND
AT 1414 GCT 3 SEPT 53

RJWK 12-2-53
APPROVED *D. J. W. E.*
1430 1500 1530
GREENWICH CIVIL TIME

GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINN.

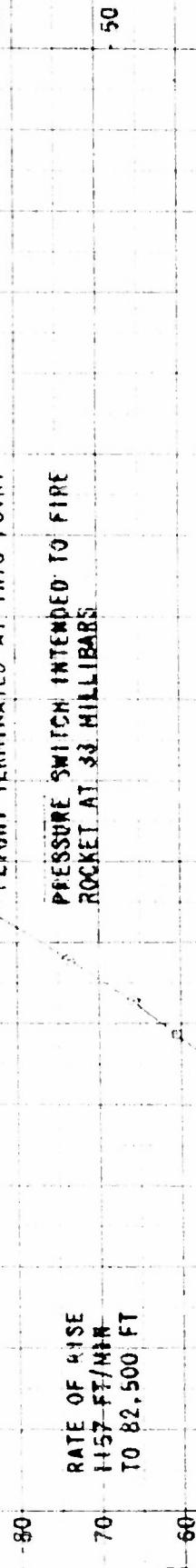
1954

RADIOSONDE AN/ANT-7A #8279

THEORETICAL CEILING

FLIGHT TERMINATED AT THIS POINT

RATE OF RISE
1457 FT/MIN
TO 82,500 FT



ALITUDE IN THOUSANDS OF FEET	TIME IN HOURS	FLIGHT NO.							
0	0								
10	1								
20	2								
30	3								
40	4	1032	1032	1032	1032	1032	1032	1032	1032
50	5	4 SEPT 53							
60	6								
70	7								
80	8								
90	9								
100	10								
110	11								
120	12								
130	13								
140	14								
150	15								
160	16								
170	17								
180	18								
190	19								
200	20								
210	21								
220	22								
230	23								
240	24								
250	25								

ALITUDE IN THOUSANDS OF FEET	TIME IN HOURS	FLIGHT NO.							
0	0								
10	1								
20	2								
30	3								
40	4								
50	5								
60	6								
70	7								
80	8								
90	9								
100	10								
110	11								
120	12								
130	13								
140	14								
150	15								
160	16								
170	17								
180	18								
190	19								
200	20								
210	21								
220	22								
230	23								
240	24								
250	25								

ELAPSED TIME IN HOURS
1630 1700
GREENWICH CIVIL TIME

RJMK 12-3-53
APPROVED

GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINN.